DRYOPITHECUS TEETH FROM KEIYUAN, YUNNAN PROVINCE

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Dryopithecus is the best-known form of higher fossil anthropoids which were generally considered not only to be ancestral to the large living anthropoids but also very probably close to the human line. In the late Miocene of Europe and Africa and the Pliocene of Europe and southern Asia a considerable number of *Dryopithecus* specimens were discovered. But it has never been found in China before. However, in February of last year, geologists T. M. Wang & W. S. Lin working in the Hsiaolungtan coal field in Keiyuan District, Yunnan Province found some mammalian fossil teeth from the younger Cenozoic lignite beds (Hsiaolungtan Series). Among the specimens collected are five lower cheek teeth of *Dryopithecus*. They are the broken crowns of the left and right lower premolars respectively, the complete crowns of the left and right and lower second molars and the crown of the right lower third molar. All belong to the same mandible. They are of dark grayish color and highly fossilized. Associated with the *Dryopithecus* teeth are molars of a *Tetralophodon* which clearly indicates the Pontian age (early Pliocene) of the fossil-bearing lignitic beds. A brief description of the teeth is given below.

DESCRIPTION

1. Lower second molar (Pl. I, 1,2)

The material of the lower second molar consists of two specimens, one right and one left. The left specimen is merely the crown without any root, while the right tooth bears a broken posterior root. Both crowns are moderately worn. Their dimensions are given in table 1. The two crowns are so similar as if they were the mirror image of each other, so the following descriptions apply to both specimens as well.

The crown bears five typical cusps of the anthropoid lower molar. The cusps descend steeply to the base of the crown on the lingual side but more gently on the buccal surface.

Of the main cusps the metaconid is the largest and highest, the protoconid and hypoconid are about equal in size, the entoconid is a little smaller, and the mesoconid is the smallest of all. The height of the cusps descends in the following order: metaconid, entoconid, hypoconid, protoconid and mesoconid. The mesoconid is displaced toward the outer side. There is

Table 1.* Measurements (in mm) of Crowns of Teeth of *Dryopithecus keiyuanensis*

	M_2(D)	M_2(S)	M_3(D)	P_4(D)
Height	(5.6)	(5.6)	(5.5)	(7.6)
Length	11.8	11.8	12.0	9.0
Breadth	10.0	10.2	10.0	9.5
Leng. Bread. index	84.7	86.4	83.3	105.6
Trigonid breadth	10.0	10.2	10.0	
Talonid breadth	9.8	10.0	- 9.6	
Trigonid index	100.0	100.0	100.0	
Talonid index	98.0	98.0	96.0	

*In the present table, "D" stands for the right side and "S" for the left side.
*Numerals within brackets refer to crown which is partly worn off.

no secondary cusp between the entoconid and the mesoconid. The cingulum on the exterior side is more distinct than that on the interior side. The sulcus between the protoconid and the hypoconid terminates on the buccal surface at the exterior cingulum, while that between the metaconid and the entoconid on the interior surface is much shallow and terminates at the extremely reduced vestigial cingulum.

Though the teeth are moderately worn, some of the folds on the cusps are still visible. The most anterior grooves of the protoconid and metaconid constitute the remainder of the fovea anterior which could not have been very deep, since it has already begun to disappear with moderately wear. The fovea posterior remains only as a small pit.

The posterior root projects markedly backward.

The size and general morphology of the teeth are comparable with *Dryopithecus punjabicus* Pilgrim found from the Chinji zone of the Lower Siwaliks in India.

2. Lower third molar (Pl. I, 3)

The dimensions of this tooth are given in table 1. It is a little longer than the M_2. The talonid is relatively more reduced with respect to the trigonid than in the anterior molars. The fovea posterior has been obliterated by wear, but there is a trace of the fovea anterior. As the crown narrows posteriorly, the mesoconid occupies a lateral position.

As the anterior molars, the buccal cusps of this tooth show a greater degree of wear than do the lingual cusps. The dentine is exposed in small pits on the buccal cusps. The metaconid is the largest and highest cusp. The description of the size and height of the different cusps of the second molars applies equally well to the third molar. However, there is indication of the presence of the "sixth cusp" which is jammed between the mesoconid and the entoconid and occupies a medial position. Besides, another small

subordinate cusp between the metaconid and entoconid is present. It seems to be a portion of the metaconid but with a clear demarcation which extends even a little bit on the lingual surface of the crown.

The cingulum exists only in the form of a broad ridge which is more marked on the buccal wall than on the lingual one. The furrow separating the protoconid and hypoconid only descends on the buccal surface as far as the cingulum, while that between the entoconid and the secondary cusp which intervenes between it and the metaconid is only faintly marked on the internal wall. There is a distinct oval polished contact facet on the front wall.

The roots are broken off. But judging from the remaining basal parts of the roots, we can see that the hinder root of this tooth extends strongly backward.

An interesting feature of the present tooth is that the greatest breadth of the crown is near the front end, whence the sides of the tooth converge backward to a rather narrow hinder tip, so that the general shape of the tooth may roughly be described as sub-triangular. In this way it resembles closely that of *D. punjabicus,* but differs from *D. rhenanus* and still more from *D. fontani* and *D. darwini.*

Another similar feature in both *D. punjabicus* and the present specimen is the presence of secondary cusps. Besides the main cusps, there are two secondary cusps, which may be distinguished from the main cusps by fairly deep furrows. These occur between the metaconid and entoconid and between the entoconid and mesoconid.

Table 2. Measurements (in mm) and indices of different species of *Dryopithecus* (all from G. E. Lewis. except *D. keiyuanensis*)

Specimen	M_3			M_2			P_4		
	Long.	Trans.	Index	Long.	Trans.	Index	Long.	Trans.	Index
Dryopithecus keiyuanensis	12.0	10.0	83.3	11.8	10.1	85.6	9.0	9.5	105.6
Dryopithecus punjabicus	12.5	10.4	83	11.6	9.9	85			
Dryopithecus fontani	12.5	10.5	84	12.0	10.5	87	9.0	8.0	89
Dryopithecus rhenanus	11.8	9.8	83	10.0	8.4	84			
Dryopithecus darwini	13.5	11.8	87						

The entoconid in both *D. punjabicus* and the present specimen lie nearer the centrum than the metaconid, so that both teeth taper at the posterior ends, though the former tapers even more than the latter.

However, there exist some differences between the tooth of *D. punjabicus* and the present specimen. Firstly, the tooth of *D. punjabicus* is of a bigger size than the present tooth. Secondly, the protoconid and the hypoconid of *D. punjabicus* are about equal

in size. But in the present specimen the protoconid is larger than the hypoconid. Thirdly, the three outer cusps of *D. punjabicus* are arranged in a curve, the hypoconid being situated more inwardly than the protoconid, and the mesoconid more so than either. In the present specimen the hypoconid is situated on the same extent outwardly as the protoconid, but the mesoconid being more inward.

3. Lower second premolars (Pl. I, 4)

Our material of the lower second premolars consists of two broken teeth, one right and one left. In P_{4D}, the postero-lateral part of the crown had been broken away and in P_{4S}, the antero-lateral and postero-medial parts had been broken away. Combine the two teeth giving us a nearly complete picture of the crown.

This tooth, in contrast to that of *Dryopithecus fontani,* is a little broader than long. Its outline forms roughly a parallelogram with a convex outer side. It consists of an inner and an outer cusp which are united by transverse ridges. In front of and behind the median ridge are two cavities, of which the foremost is smaller and shallower than the hinder one. The latter is not only deeper but stands at a lower level than the rest of the crown. The hind cavity and the back edge of the tooth may be known as a talon which is rather pronounced.

CONCLUSION

From the foregoing description, it can be concluded that the present specimens are comparable to *Dryopithecus punjabicus.* However, there exist some differences. In addition, the present specimens were found in a different locality quite distant geographically from that of *D. punjabicus.* Thus, a new species *Dryopithecus keiyuanensis* is suggested for the new materials. This new discovery in China, where *Gigantopithecus* and *Sinanthropus pekinensis* and many other human fossils were found, gave indications that this region will offer rich prospects for the paleoanthropologists in providing further evidences in this direction when it will later be systematically and carefully explored.

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雲南開遠發現的森林古猿牙齒化石

(中 文 摘 要)

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現在一般都認爲森林古猿不僅是現存的大的類人猿的祖先，而且很可能也是人類的遠祖。這類古猿的化石過去曾在歐洲和非洲的中新統晚期以及歐洲和亞洲南部的上新統地層中發現。1956 年 2 月，地質部西南地質局的汪泰茂和林文善同志在雲南開遠小龍潭村西北調查地質時，在第三紀煤系中發現了一批牙齒化石，經我們鑑定後，確定其中有五個牙齒是森林古猿的下頷頰齒。這五個牙齒是左右下前臼齒的破碎齒冠和左右下第二臼齒和右下第三臼齒完整的齒冠，是屬于同一下頷的。牙齒呈深灰色，石化程度很深。同時發現的還有四稜象的臼齒，因此可以確定小龍潭煤系的地層是蓬蒂紀（上新世初期）。這是森林古猿化石第一次在中國的發見。對從猿到人的轉變過程有着重要的意義，現在把各牙齒化石的形態加以簡單描述。

1. 下第二臼齒（圖版 I, 1,2）

下第二臼齒的化石共有兩個臼齒的齒冠，齒根已大部喪失，僅右臼齒還殘留後根的一部分。兩個齒冠都已有中等程度的磨蝕。齒冠的測量見表 1.（第 26 頁），由於這兩個齒冠系屬於同一下頷的，形態非常相像，因此以下的描述同樣適用於兩者。

齒冠具有猿類下臼齒的五個標準的主要齒尖。各齒尖中以下後尖爲最高和最大，下原尖和下次尖的大小約等，下內尖稍小，而以下次小尖爲最小。各齒尖的高度，由高到低，排成下列順序：下後尖，下內尖，下次尖，下原尖和下次小尖。

齒扣在頰側較在舌側爲明顯。分隔下原尖和下次尖的溝在齒冠的頰面下延到齒扣處終止，在舌面的溝則遠較頰面爲淺，也同樣終止於殘留的齒扣。

雖然齒冠已有中等程度的磨蝕，但咬合面上的嵴紋有些仍可看出。下原尖和下後尖上最前的溝相遇而成淺的前凹 (fovea anterior)。既然在中等程度磨蝕的牙齒上前凹便很淺，由此可知即在未磨蝕的牙齒，前凹也不深。後凹 (fovea posterior) 則僅殘留一小坑。

這個牙齒無論在大小和形態上，都可與在印度西瓦立克發現的 *Dryopithecus punjabicus* 的牙齒相比。

2. 下第三臼齒（圖版 I, 3）

下第三臼齒的大小見表 1，稍較下第二臼齒爲長。齒冠後部寬與前部寬之比也較第二臼齒爲小。後凹已因齒冠磨蝕而消失，前凹也僅有一些痕跡。由於齒冠愈向後愈窄，因此下次小尖的地位偏向外側。

下第三臼齒也和第二臼齒一樣，頰側各齒尖磨蝕的程度大於舌側的各齒尖。頰側各齒尖咬合面上的齒骨質已因磨蝕而暴露成爲小坑。各主要齒尖也以下後尖爲最大和最高，上一節中對於下第二臼齒各齒尖的大小和高度的敍述也同樣適用於下第三臼齒。但是下第三臼齒却另有兩個副尖存在。在下內尖與下次小尖之間可見有"第六齒尖"存在的痕跡，位於正中線的內側；另一小的副尖位於下後尖與下內尖之間，看來好像是下後尖的一部分，但又與下後尖有一明顯的分界線，不僅在咬合面上是如此，分界線並且延展到齒冠舌面的一部分。

齒扣形成低平的寬嵴，頰面較舌面爲明顯。分隔下原尖和下次尖的溝在齒冠舌面下延達齒扣而止。在下內尖與小副尖之間的溝在舌面僅有微弱的痕跡。齒冠的近中面有一明顯的卵圓形的光滑接觸區。

齒根已全部斷裂，但從殘留的齒根基部判斷，仍可看出後根明顯向後傾斜的情形。

這個牙齒的有趣之點是齒冠的最大寬接近前端，愈向後愈窄，所以後端較狹，因此齒冠有些近乎三角形。就這點來說，它與 *D. punjabicus* 非常相似，而與 *D. rhenanus* 不同，與 *D. fontani* 和 *D. darwini* 則差別更大。

這個牙齒的另一與 *D. punjabicus* 的相似點是兩者除有五個主要齒尖外，又都有二個副尖存在。一個在下後尖與下內尖之間，另一個在下內尖與下次小尖之間，與主要齒尖有相當明顯的分界線隔開。

這個牙齒和 *D. punjabicus* 的牙齒，它們的下內尖與齒冠中央的距離都較下後尖爲近，因此兩者的後端都較尖，雖然 *D. punjabicus* 第三臼齒的後端較本標本更尖一些。以上三點都是本標本明顯與 *D. punjabicus* 的相似之點。

但本標本與 *D. punjabicus* 的標本也有若干不同之點。首先是 *D. punjabicus* 的下第三臼齒比本標本爲大；其次是 *D. punjabicus* 的下原尖與下次尖的大小約等，而在本標本上則下原尖大於下次尖。第三是 *D. punjabicus* 頰側的三齒尖排列成弧形，也就是下次尖的位置較下原尖爲偏於內側，而下次小尖則更偏內。在本標本上，下次尖在外側的範圍與下原尖相似，僅下次小尖的位置較內。

3. 下第二前臼齒（圖版 I, 4）

本文下第二前臼齒的材料計有破碎的齒冠二個，左右各一。右齒冠的後外部破裂，左齒冠在前外部和後內部破裂。兩者併合觀察，可得一近乎完整的齒冠。

這個標本與 *D. fontani* 的下第二前臼齒不同，寬度較長度稍大。它的外形有些像稍斜的平行四邊形，四邊稍稍向外突出。具有一個內齒尖和一個外齒尖，兩尖之間有幾條橫嵴相連。在正中嵴之前和之後各有一窩，但前窩較後窩爲小而淺。後窩不僅較深，它的底且是齒冠咬合面上最低的部分。後窩和齒冠的後緣合成明顯的第二前臼齒的跟 (talon).

結 論

從以上的叙述中，我們可以看到本標本是與 *D. punjabicus* 很相似的，但是兩者又具有某些不同之點。此外，兩者發現的地點也相距甚遠，因此我們建議把本標本定爲一新種 *Dryopithecus keiyuanensis*. 這個森林古猿新種的第一次在中國發現，具有很重要的意義。大家知道，在中國已經發現有最早的人類化石之一的中國猿人以及巨猿化石等，而森林古猿又很可能是猿和人遠古的共同祖先，因此今後在我們的國土上，有計劃地和科學地進行發掘工作，必然會有更多的從猿到人的各種階段的化石發現，爲人類的發展史提供豐富的資料

Explanation of Plate I

Teeth of *Dryopithecus keiyuanensis*

1. Right lower second molar:

   a. buccal view, × 2; b. lingual view, × 2;
   c. mesial view, × 2; d. distal view, × 2;
   e. occlusal view, × 2; f. occlusal view, × 1.

2. Left lower second molar:

   a. occlusal view, × 2; b. occlusal view, × 1.

3. Right lower third molar:

   a. buccal view, × 2; b. lingual view, × 2;
   c. mesial view, × 2; d. distal view, × 2;
   e. occlusal view, × 2; f. occlusal view, × 1.

4. Right lower second premolar:

   a. occlusal view, × 2; b. occlusal view, × 1.



1 a



1 b



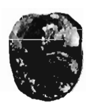
1 c



1 d



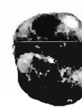
1 e



1 f



2 a



2 b



3 a



3 b



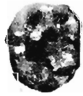
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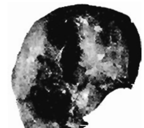
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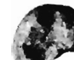
3 e



3 f



4 a



4 b